MicroMet

MBTU10X Version 1.05

Installation and Operation Manual

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Micro Specialties, Inc.

P.O. Box 871077
Wasilla, Alaska 99687-1077
Ph: 907-373-7424
Fax: 907-376-2894
Micro-Specialties.com

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Conventions Used in This Manual

MicroMet and CR10X commands are printed in bold face for clarity.

'**Warning**:' indicates that a command or configuration change could have an adverse affect on system performance.

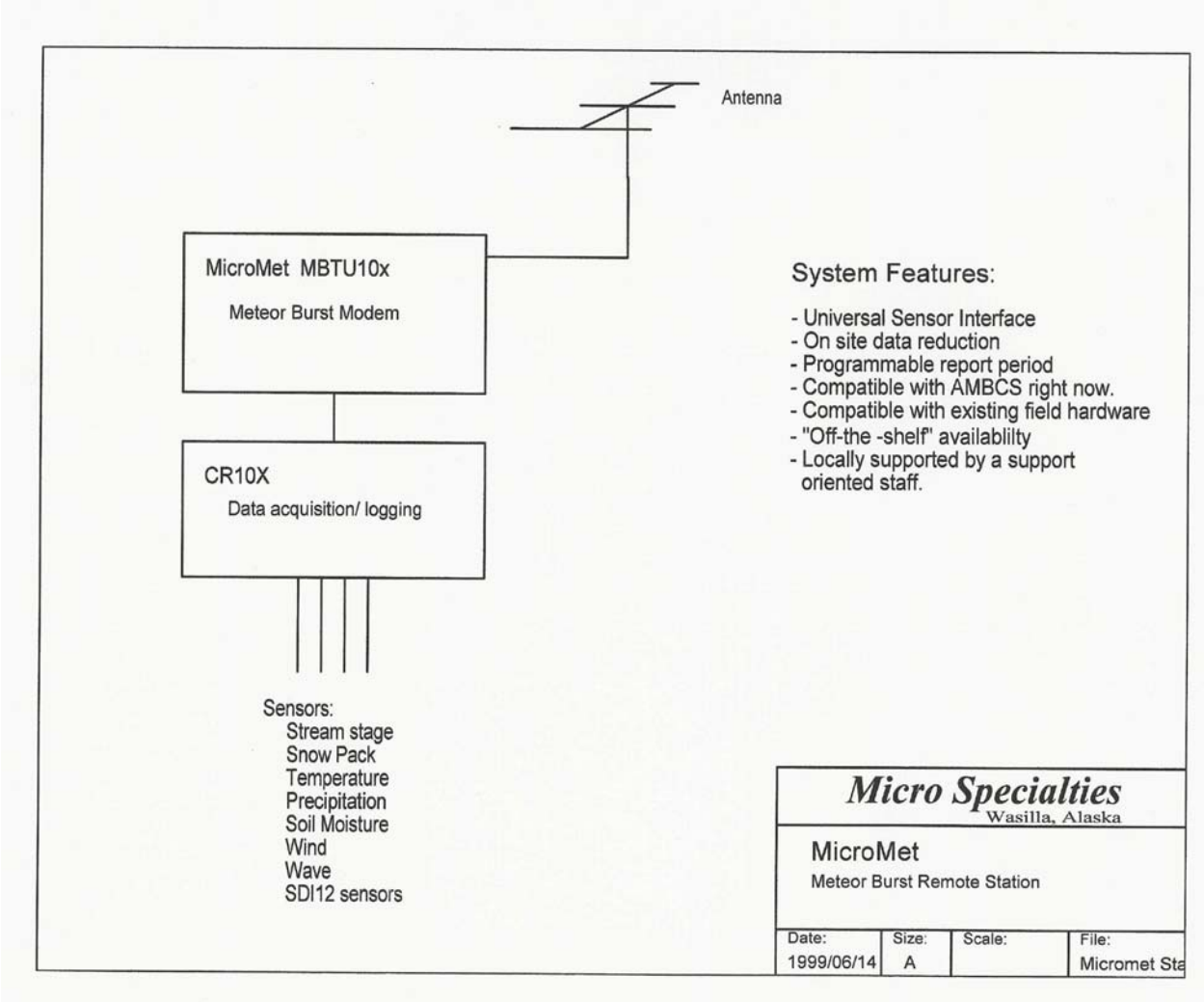
MicroMet command parameter options are shown in square brackets to indicate that they are indeed optional. Required parameters are not shown in brackets.

About *MicroMet*

The *MicroMet* MBTU10X is designed to transport data, gathered by a Campbell Scientific CR10X Datalogger, across the AMBCS Meteor Burst Data network. The *MicroMet* MBTU10X is very simply a data modem. It does no data collection or data manipulation or data validation. Any data received from the CR10X will be cheerfully passed along to AMBCS. The CR10X program contains some programming that is specific to the *MicroMet* transport system. As with any data transport system there are some rules that must be adhered to, if data is to be successfully transported to the desired destination. The rules are simple:

1. Data reports are received from the CR10X via a data cable connected between the CR10X 9 pin CS I/O connector and the *MicroMet* 10 pin IDC J4 connector. We provide that cable for you. This connection is set in the *MicroMet* to operate at **1200 baud** and the CR10X will adapt to that rate.
2. Data reports consist of a comma delimited string containing the storage area ID of 444, the Julian date, the time in HHMM format, and from one to sixteen data points. The string is terminated with a carriage return. A report as follows: 444,123,0000,1253,0,4000 is from day 123 at midnight and has three sensors 1253, 0, and 4000.
3. Data points are integers in the range of 0 through 4095. Negative numbers are given the value of zero. Real numbers are truncated at the decimal point. (123.123 becomes 123) Numbers greater than 4095 are given the value of 4095.
4. The CR10X time must be set to Alaska Standard Time.

With these rules in mind, the CR10X may be programmed to send reports at any interval, but the data must be scaled to the correct integer size. You can observe the data messages generated by the CR10X either by using the PC208W terminal tab or by observing them as they pass through the *MicroMet* unit (verbose 5 command).


Antenna
MicroMet MBTU10x
Meteor Burst Modem
CR10X
Data acquisition/ logging
Sensors:
Stream stage
Snow Pack
Temperature
Precipitation
Soil Moisture
Wind
Wave
SDI12 sensors
System Features:
- Universal Sensor Interface
- On site data reduction
- Programmable report period
- Compatible with AMBCS right now.
- Compatible with existing field hardware
- "Off-the -shelf" availablilty
- Locally supported by a support oriented staff.
Micro Specialties
Wasilla, Alaska
MicroMet
Meteor Burst Remote Station
Date: 1999/06/14
Size: A
Scale:
File: Micromet Sta

CR10X processing for *MicroMet*

Version 1.03 and above

The CR10X, when used with the *MicroMet* MBTU10X for data transport, must be programmed specifically with the MBTU10X in mind. The CR10X must:

1. Output a data message to its serial port at 1200 baud. The data message format must be as follows: 444,JJJ,HHMM,s1,s2…snCRLF
2. Data points must be integer values in the range of 0 to 4095. Any non-integer values are truncated by MBTU10X to integer size (40.99 becomes 40). Any values less than zero (0) become zero (0). Values larger than 4095 become 4095.

The process in the CR10X looks like this:

- Assign the data storage ID of 444.
- Every few seconds:
  1. Read the sensors.
- Every hour:
  1. Calculate and save the hourly summary values to input locations.
  2. Scale the input locations for transport (0-4095) and output them to the serial port. (Also saved to output locations.)
  3. Output a CRLF sequence to the serial port.
- Every day (midnite):
  1. Calculate and save the daily summary to input locations.

Things to consider when modifying a CR10X program for *MicroMet:*

- Sensors
- Sensor input labels. Edit these with PC208W so they match what sensors you actually have.
- Transport scaling.
- Number of sensors output from scaling input area.
  - Scaling input labels. (vB12, iSWT, iPst,…) These must be in order delivered to master station.

Installation

Site Selection Considerations

Communications Window Aperture
What is the horizon in the direction of radiation (toward the Master Station)? If the horizon toward AMBCS is high and the site is at long range (600+ miles), communications may be very slow.

Local Interference
Try to locate the station away from potential radio interference sources such as high voltage power transmission lines, engine ignition systems, etc. When potential interference systems are in the general area, try to locate the site such that the antenna does not look toward those interference sources.

Sensor Installation Considerations

Here are some thoughts regarding the installation of the sensors.

1. It is generally a good idea to keep the site power cabling, the coaxial antenna cable and the sensor cabling separated as much as possible to keep the sensor noise out of the radio receiver and to keep the radio transmitter power out of the sensors. Three separate access holes are provided in the NEMA box with that in mind. Excess cable length should be coiled in a figure eight fashion to minimize inductive coupling.
2. Since sensor mounting devices have metallic components, and sensors themselves can be noise sources, it is wise to locate the sensors away from the plane of the radio antenna. Try not to locate sensors near the antenna or within the antenna's 60 degree window toward the Master Station. If possible, locate sensors and their structure off to the side of the antenna.

Installing the *MicroMet* Communications Unit

MicroMet data communications units come in two varieties, one with a 300 watt transmitter and one with a 100 watt transmitter. Both varieties are functionally equivalent, but have slightly different component configurations. The *MicroMet* 100 requires only a single12 volt power source, while the *MicroMet* 300 requires a transmitter battery pack and a Power Control Unit which charges the transmitter battery pack from the 12 volt power source.

The steps involved in installing the *MicroMet* unit are as follows:

- Mount the *MicroMet* unit securely to the enclosure wall or mounting panel.
- Mount the Power Control Unit to the enclosure wall or mounting panel (*MicroMet* 300 only).
- Connect the *MicroMet*/Power Control Unit interconnect cabling (*MicroMet* 300 only).
- Mount the CR10X to enclosure wall or mounting panel.
- Connect the *MicroMet* data cable between the CR10X CS I/O receptacle and the *MicroMet* J4 receptacle.
- Connect the Coaxial antenna cable to the Antenna receptacle on the *MicroMet*.
- Connect the 12 VDC power cable between the site battery and the *MicroMet* 12 VDC receptacle (*MicroMet* 100 only).
- Connect the 12 VDC power cable between the site battery and the Transmitter Battery Pack (*MicroMet* 300 only).
- Place the Power switch on the Power Control Unit in the “on” position (*MicroMet* 300 only).

This completes the general installation of the *MicroMet* data communications unit. Please remember to verify proper operation of the *MicroMet* unit before departure (see **Checking *MicroMet* Communications Performance, pg 14**).

Setting up a Windows95/98 Computer to talk with the *MicroMet*

Normal operation of the *MicroMet* unit is fully automatic, and should require little attention. When the site is first powered up, and before departing the site, it is a good idea to connect to the *MicroMet* unit to verify that proper communication is occurring. You can use Windows Hyperterm to talk with the *MicroMet* unit.
Here is what you do:

1. Start up Hyperterm (**start > programs > accessories> Hyperterm**).
2. Cancel the startup banner.
3. Select: **file > new connection**. Name the new connection *MicroMet*. Then OK.
4. Select Connect using: Direct to COM2 (or whichever COM port your nine pin connector occupies)
5. Properties window pops up. Select **9600 baud, 8 bits, no parity, 1 stop bit, and no flow control.**
6. **OK** your way out of the properties panel.
7. You should now be all set to talk with the *MicroMet*.

Operation

MicroMet Observations.

The top *MicroMet* printed circuit board has five Light Emitting Diodes (LED) That can tell you a lot about how the *MicroMet* is communicating. On power up, or cold start, *MicroMet* enables the lights. *MicroMet* will automatically turn the lights off at midnight, or they may be turned on or off with the **lights** command. A summary of the lights:

- **SP** - Signal Presence. This light indicates that the receiver is acquiring a signal. This signal could be the Master Station or it could be local noise. Unless you are within 100 miles of the Master Station, this light should NOT be on all the time. Remember that meteor events are short in duration.
- **SYNC** – Sync Detected. Embedded in the Master Station's probe is a sync character which *MicroMet* uses to verify that the probe is valid. When MicroMet detects this character in proper sequence, it has acquired sync with the Master Station. When sync is acquired *MicroMet* momentarily turns on the SYNC light.
- **TX** – Transmitter On. *MicroMet* is attempting to send a message in response to a valid Master Station probe.
- **VSWR** – The radio transmitter has detected a faulty antenna or coaxial cable. No communication is possible while condition persists.
- **LOPWR** - The radio transmitter's power output is low. This may be an indication of a faulty radio transmitter or a weak battery. This light often accompanies the HIVSWR light, as the transmitter shuts down in response to the HIVSWR.

MicroMet Commands - MBTU10X Rev 1.05

The *Micromet* command structure is simple and concise. All commands are terminated with the **ENTER** key.

Canmsg [n] or [off] – Generate a new simulated data message **n** sensors in length once per minute.

Example: **canmsg** 8 – will generate a new simulated data message of eight sensors each minute, on the minute.

To use this function, you should know what number of sensors AMBCS expects from your remote.

Warning: Canmsg will generate messages until you turn it off with the command: **canmsg off**. This will interfere with normal data transport.

Warning: Canmsg uses the *MicroMet* clock to generate message. Set the time before turning **canmsg** on.

Warning: If the **Canmsg** sensor count parameter is not set to the number of sensors expected by the Master Station, the TX/ACK ratio may be very high.

MicroMet 1.05 and above turn *Canmsg* off at midnite.

Id [nnnn] – Display or set the primary communication identifier. This should normally not be changed without coordination with the AMBCS System Administrator.

Warning: Changing this value may cause the unit to fail to communicate with AMBCS.

Lights [on] or [off] – This command allows the user to enable or disable the test lights on the transceiver interface. *MicroMet* automatically turns the lights on at start up and off at midnight.

Reset – Restart the system.

Warning: Parameters such as ID are NOT reset to default values. If you change the ID inadvertently, you **MUST** change it back explicitly to the correct ID.

Stat – Display communications statistics. Values are displayed for the current day and the current hour. Values displayed are:

RXSP – The number of times the receiver threshold has been crossed. Probable receptions from the Master Station.

SYNC – The number of verified receptions from the Master Station.

RXERR – The number of times this unit failed to verify a reception (receive sync).

XMIT – The number times this unit has turned on its transmitter.

ACK – The number of times this unit has received an acknowledgement from the Master Station in response to a message transmission.

HIVSWR – The number of times the transmitter has detected a bad antenna/coax.

LOPWR – The number of times the transmitter has failed to develop full power.

T – Test transmission. *MicroMet* will turn on its transmitter and attempt to send whatever is in its immediate transmit queue. This is a quick way to test the antenna system. Any faults will result in warning messages. If no warnings are displayed, then the antenna and transmitter systems are OK.
Warning: Test transmission is meaningless until a data message has been enqueued. After a COLDSTART, set the time and use **canmsg** to enqueue a data message before using Test transmission.

Version 1.05 and above will generate a single canned message if no message has been enqueued.

Time [YY MM DD HHMM] – Display or set the unit's real time clock.

Verbose [+] or [-] or [nn] – Display or set the level of advisories issued by MicroMet. Any value between 1 and 100 may be entered. + increments the value by one, - decrements the value by one. The default value is 1. A value of 5 or above will allow *MicroMet* to display data reports as they are received from the CR10X (see **Warnings and Advisories, pg 10.**)

Txrate [n] – Display or set the sync rate at which *MicroMet* is allowed to respond to AMBCS. *MicroMet* will respond to no more than every nth sync. This keeps remotes in close proximity to each other from responding simultaneously. Default is 10.
Warning: Please check with the AMBCS system administrator before adjusting this parameter!

Warnings and Advisories

MicroMet may issue various **advisories** or **warnings** to indicate a change in system status. **Advisories** are simply a way for *MicroMet* to advise you of a normal change of status. **Warnings** are meant to get your attention, and to warn you of an unexpected problem. **Warnings** are always issued without regard to the verbosity level, while **advisories** are keyed to the verbosity level. The higher the verbosity level the more **advisories** will be issued.

ADVISORY
YY/MM/DD HHMM New data Msg:…

This **advisory** indicates that *MicroMet* has received a new data message from the CR10X. This new message is immediately enqueued for delivery to AMBCS. This **advisory** is displayed at a verbosity level 5 and above.

ADVISORY
YY/MM/DD HHMM Message delivered to Master Station.

This **advisory** indicates the data message has been delivered and acknowledged by the Master Station. The message is immediately dequeued. This **advisory** is displayed at a verbosity level

WARNING
YY/MM/DD HHMM HiVSWR! Check antenna System.

This **warning** indicates that the radio transmitter has detected a bad antenna or transmission line. If this condition persists, no communication will occur. Check the antenna for proper assembly and broken components. Check the coaxial transmission line for continuity, good connections, etc. See **Troubleshooting**, **pgs 19-23**). This **warning** may also accompany the HiVSWR **warning** as the transmitter does shut down during a HiVSWR event.

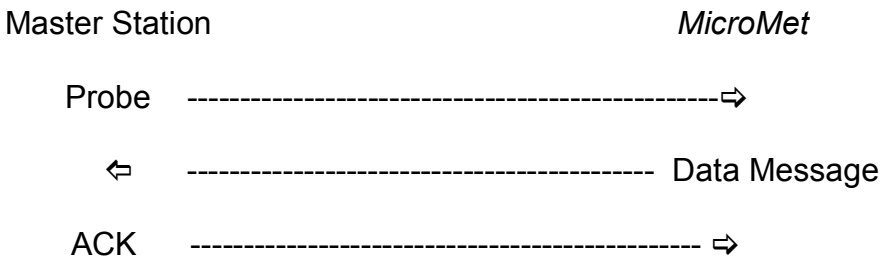
WARNING
YY/MM/DD HHMM Low Transmitter Power!

This **warning** indicates that the radio transmitter is not developing the proper level of transmit power. Check the capacity of the system battery and connections. This **warning** may also accompany the HiVSWR **warning** as the transmitter does shut down during a HiVSWR event.

Communications Cycle

MicroMet MBTU10X operates as a power conserving remote node in a 'star' network topology. The network protocol is implemented with a 'probing Master Station'. This means that a *MicroMet* talks only to the Master Station, and that it communicates only in response to a probe from the Master Station. In this configuration, the Master Station is continually probing in an attempt to initiate communication with any remote node (*MicroMet*). Meteor Burst phenomena provides a type of automatic time division multiplexing such that it is unusual for multiple remote nodes to 'see' the Master Station's probe simultaneously.

From the *MicroMet's* perspective, it's role is to listen for the probe. If *MicroMet* receives a valid probe, then it will attempt to respond by transmitting a data message from it's queue. At the end of it's transmit cycle, *MicroMet* listens for an acknowledgement (ACK), which the Master Station will send in response to the data message. If the ACK is received, *MicroMet* will dequeue the data message, and return to the listening state. If *MicroMet* has no messages enqueued for delivery to the Master Station, it will not transmit a response to the probe.



Understanding Communications Statistics (Stat Command)

RXSP Signal Presence – this is the number of times the radio receiver has detected a radio signal that may have been a signal from the Master Station, or it may have been radio interference. In close proximity to the Master Station, the *MicroMet* will normally detect many thousands of RXSPs per hour. At meteor range, 150-1000 miles, the *MicroMet* will most likely detect a few hundred RXSPs per hour.

SYNC Sync Character Detected – when the receiver detects a signal (RXSP) the *MicroMet* begins to watch for a special code in the received data stream called a Sync character. This Sync character must be received in order to validate the signal received from the Master Station. Under ideal conditions, for each reception (RXSP), *MicroMet* would receive one Sync or validated reception. Under normal conditions, errors in the received data caused by radio interference, make the ratio of RXSPs to Syncs somewhat greater than 1:1. A good ratio in the field is probably around 2 or 3 to 1.

RXERR Receive Errors – if the *MicroMet* detects the Sync during a reception, it then continues to receive data until the entire probe is complete. If all goes well with the reception, and the data stream is complete, then the RXERR does not increment. A high number of RXERRs indicates poor reception due to interference.

XMIT Transmit Cycles – this number is incremented each time the *MicroMet* turns on its transmitter. Under ideal conditions the *MicroMet* would activate it's transmitter only once for each data message it receives from the CR10X.

ACK Acknowledgement of Data packet – when the *MicroMet* transmits a data message, it hopes to immediately receive an ACK from the Master Station. If this ACK is received, *MicroMet* dequeues the data message and shows a 'Message Delivered' advisory on the operator's console or PC Terminal. If no ACK is received, the data message remains enqueued, and the *MicroMet* will attempt to transmit the data again. *MicroMet* can only transmit in response to a 'probe' or valid reception, which it receives from the Master Station.

XMIT TO ACK Transmit to ACK Ratio – under ideal conditions, the ratio of XMIT to ACK would be 1:1. In the field, a ratio of 2 or 3 to 1 should be considered to be very good. A ratio in excess of 10 or 20 to 1 should be considered to be very marginal. If no ACKs are received, no data messages are being delivered and the site is nonfunctional!

HIVSWR High Voltage Standing Wave Ratio – this means that during a transmit cycle, *MicroMet's* transmitter hardware detected a problem with the coaxial transmission line or the antenna. When this happens, the transmit cycle is terminated, and no data delivery has taken place. *MicroMet* always prints a WARNING when this happens.

LOPWR Low Transmitter power – this means that during a transmit cycle, *MicroMet's* transmitter hardware detected a low transmitter power level. When this occurs, the transmit cycle continues, and data delivery may still have taken place. *MicroMet* always prints a WARNING when this happens.

LOPWR can be caused by:

1. A marginal or depleted battery in the transmitter battery pack (*MicroMet* 300 only).
2. A marginal or depleted site battery (*MicroMet* 100 only).
3. If HIVSWR also occurred, a faulty coax or antenna.
4. A bad transmitter.

Checking *MicroMet* Communications Performance

1. Connect the *MicroMet* cable between the PC and J3 of the *MicroMet* unit.
2. Type the command **Verbose 5** followed by the ENTER key. *MicroMet* should respond 'Verbosity 5'. This tells *MicroMet* to display level five warnings and advisories.
3. Set the *MicroMet* time with the time command. The time command uses the form: **time YY MM DD HHMM**. *MicroMet* will respond with the correct time.
4. With verbosity set to level five (verbose 5), MicroMet will print an advisory each time a new data message is received from the CR10X (usually on the hour), and will print an advisory each time a message is delivered to the Master Station.
5. Use the **Stat** command to display *MicroMet* performance statistics. Stats are compiled for the current day as well as the current hour. Transmit to Acknowledgement ratio is an important performance statistic. This ratio should not normally exceed 10 to 1, and should usually be in the range of 2 or 3 to 1 over a long period of time. (See **stat** command explanation, pg 8, for a description of information displayed).

Warning: Sometimes the PC can interfere with the radio receiver. When this is happening, the SP light will flash more frequently, and the SP to SYNC ratio will be low. It is generally a good idea to unplug the cable at the *MicroMet* J3 connector between uses. Plug in, check status, then unplug.

Since I am impatient, and I don't like to wait for the data logger to generate messages, I usually use **canmsg** to generate a few messages very quickly. To do this:

1. Set the *MicroMet* time. **Time YY MM DD HHMM**
2. Turn on canned message mode. **Canmsg 8.** The parameters here should match the number of sensors expected from the CR10X.
3. Observe the messages being generated and take stats occasionally. **Canmsg** will post a new message every minute.
4. Don't forget to turn the canned message mode off when you are through testing! **Canmsg off.**

CR10X Datalogger Operations

Loading a CR10X program from PC208W

When a new program needs to be installed in the CR10X data logger at a MicroMet data site, you must connect to the CR10X with your PC, start PC208W and send the program to the CR10X from your PC with PC208W. The file to be sent to the CR10X is called a DLD file and has the file extension of dld. Hence the file may be named coldfoot.dld for example. Here are the steps to follow:

- If the dld file was provided to you on floppy diskette, copy it to the PC208W directory. The file path to the PC208W directory varies from PC to PC but should be something like C:\Campbell\PC208W or C:\CSI\PC208W.
- Start PC208W
- From the PC208 floating tool bar select the **CONNECT** button.
- The CR10X **data logger connection** window will appear. This window has three tabs along its bottom edge. Select the **TOOLS** tab.
- From the Station list on the **TOOLS** tab, select the data station your are visiting. If the station you are visiting is **not** listed, *see* **Setting up a New Station in PC208W, pg 16**.
- Make sure that the correct DLD file is associated with your data site. If it is not, press the **Associate DLD Program** button on the **TOOLS** tab, use the OPEN window to navigate to the **PC208W** directory, and select the correct dld file for this site.
- Connect the SC929 Campbell Cable between the CR10X CS I/O connector and you PC's serial data (COM) port.
- Press the CONNECT button on the TOOLS tab. This will open a connection between your PC and the CR10X.
- Verify that the CR10X time is displayed in the **Clock Synchronization** area and is correct. Remember that our system operates on **Alaska Standard Time**. If the CR10X time is not Correct, its time may be set to your PC's time by pressing the **Set Datalogger CLK** button on the **TOOLS** tab. If your PC's time is not set to the correct Alaska Standard Time, see **Setting your PC's time in Windows95, pg 16**.
- To send the dld file to the CR10X, press the **SEND** button on the TOOLS tab. PC208 will warn you that changing the program may not be what you want to do. If you choose to proceed, the **DLD file transfer progress** bar will advance, and you will eventually get a successful transfer window, indicating that the new file has indeed been sent to the CR10X.
- Upon successful installation of the new program, you should verify that the program works correctly with your sensors. See **Verifying Sensor Data with PC208W, pg 17.**
- Once you are satisfied with your sensor data you may X out of **PC208.** Be sure to disconnect your SC929 Campbell Cable from the CR10X and **reconnect the MicroMet cable to the CR10X.**

Setting up a New Data Station in PC208W

PC208W is Campbell Scientific's CR10X maintenance program that runs under Windows. Before you can send a dld program to your CR10X or check on your physical sensor readings, you must set up a connection between PC208W and the CR10X at the site. These are the steps to follow:

- Start PC208W
- On the PC208W floating tool bar, press the **SETUP** button. This will bring up the **Setup Connections** window.
- On the **Setup Connections** window press the **Add Device** button. This will bring up a window named **Add New Device**.
- On the **Add New Device** window, select **CR10X datalogger** then select the Com port with which you will communicate with the CR10X. You will want to use the Com port on your PC which has the nine pin connector. Once the CR10X and Com port are selected, press **OK**.
- On the **Setup Connections** window, highlite and rename the **datalogger name** to a name that will make sense for this site. For example Kenai_MP for Kenai Moose pens.
- On the **Setup Connections** window, set the **Baud Rate** to 9600.
- On the **Setup Connections** window press **Save Edits** to save the new site connection.
- Exit **Setup Connections**. Your new site connection is complete.

Setting your PC's time in Windows

PC208W uses your PC's date and time to set the data and time in the CR10X. Before allowing PC208W to set the CR10X date and time, you must be certain that the date and time in your PC are correctly set to **Alaska Standard Time**, not Alaska Daylight Time. Follow these steps to set your PC's date and time:

- Right click the **Time** on the right side of the Windows **Task Bar.**
- Select **Adjust Date/Time** from the menu that pops up.
- All Date and Time parameters may be individually highlighted and set with the **Date/Time Properties** window.
- On the **Date/Time Properties** window press **OK** to apply the new date and time to your PC.

Verifying Sensor Data with PC208W

Campbell Scientific's Windows based Data Logger maintenance program, PC208W can be used to verify that the sensor data collection is proceeding correctly at your new or existing MicroMet data site. Here are the steps to look at your sensor data:

- Start PC208W
- From the PC208 floating tool bar select the **CONNECT** button.
- The CR10X **data logger connection** window will appear. This window has three tabs along its bottom edge. Select the **TOOLS** tab.
- From the Station list on the **TOOLS** tab, select the data station your are visiting. If the station you are visiting is **not** listed, **See Setting up a New Station in PC208W, pg 16**.
- Connect the **SC929** Campbell Cable between the CR10X CS I/O connector and you PC's serial data (COM) port.
- Press the **CONNECT** button on the **TOOLS** tab. This will open a connection between your PC and the CR10X.
- Select the **NUMERIC DISPLAY** tab.
- Numeric values will be displayed on this tab for all the physical sensors installed at the site. These values are displayed in real numbers that should make sense compared to actual observed values at the site. If they don't you should tale a close look at your sensors, sensor wiring, etc. If all sensors are not displayed on the numeric display, you can ADD them by pressing the **ADD** button and dragging them from the **Inloc list** which will pop up. We try to place all sensors at the beginning of the inloc list.

Site Visit

Normal Site Visit Procedures

Whenever a visit is made to a *MicroMet* data site, the following checks should be performed at a **minimum:** (You can capture this session with HyperTerm capture mode.)

- Connect the PC to the *MicroMet* at J3. Located at the bottom right most connection on the *MicroMet CPU.*
  Collect and observe the communication statistics: **STAT**.
  Verify acceptable TX to ACK ratio (less than 10:1).
  Verify acceptable SP to SYNC ratio (less than 2:1).
  Verify no HIVSWR or LOWPWR.

- Connect PC to CR10X CSIO and run PC208W.
  Use NUMERIC DISPLAY to verify sensor acquisition.
  Verify CR10X time is correct (Alaska Standard Time), set if necessary.

- Verify proper antenna orientation, solar panel, etc.

Before leaving the site

Before you leave the site it would be a very good idea to:

- Verify that *MicroMet* communication statistics are normal. Abnormalities include:
  1. A high transmit to ack ratio.
  2. HiVSWR warnings.
  3. Low power warnings.
- Record status and any abnormalities. IE: transmit to ack ratio, etc.
- Verify that the cable connecting *MicroMet* and the CR10X is properly in place. If this cable is not in place, no data will ever reach the Master Station.
- Watch at least one data message get acknowledged. (verbose 5) see **Warnings and Advisories, pg 10**.
- Canmsg off.
- Take the SC929 CR10X to PC cable with you.
- Take the *MicroMet* to PC cable with you.

Troubleshooting

No Data Reports Received at AMBCS

Before troubleshooting, read and understand MicroMet Observations (pg 6), Stat Commands (pg 7), and Checking MicroMet Communications Performance (pg 13).

If no data reports are being received from a *MicroMet* site, a site visit may be required to determine the source of the problem. Since the *MicroMet* will only transport data that it receives from the CR10X, troubleshooting procedures can be broken down to two questions:

- Is the *MicroMet* receiving data messages from the CR10X?
- Is the *MicroMet* communicating properly with AMBCS?

First, connect your PC to the *MicroMet* and observe its communication statistics. If the number of SPs and SYNCs are low to nonexistent, the problem is likely in the antenna, interference, coax, receiver, or site selections. Try a test transmission to verify the antenna/coax. If the test elicits no **warnings**, the problem is most likely in the receiver and the *MicroMet* should be replaced.

If the SYNCs are good but no transmissions have been attempted (TX=0), then most likely the *MicroMet* is not receiving data messages from the CR10X. Set **verbosity** to 5 and observe the absence of new data **advisories** after an expected data message time frame. (Proceed to no CR10X data messages, page 19)

If the transmit to acknowledgment ratio is high, do a test transmission to verify the antenna/coax. Remember that zero (0) reports at AMBCS should translate to zero (0) acks at the *MicroMet*. Problems in the antenna/coax/battery should elicit HIVSWR or Low Power **warnings**!

No CR10X Data Messages

- If you suspect that the CR10X is not producing any data messages, you should connect your PC to the CR10X and run PC208W.

- If the CR10X time is drastically incorrect or even not incrementing, the CR10X should be replaced.

- Monitor the CR10X data with NUMERIC DISPLAY to verify that sensor data is being collected.

- You can also monitor the data messages being sent to the *MicroMet* by opening the TERMINAL tab on PC208W. If data messages appear here at the expected interval, then the CR10X is probably okay. These data messages traverse the cable between the CR10X CSIO and the *MicroMet* J4, verify this cable is plugged in correctly at both ends.

Resolving Bad Sensor Readings (CR10X)

- Connect your PC to CR10X CSIO, and run PC208W.

- Use the **NUMERIC DISPLAY** tab to observe the live data being collected by the CR10X. If these data do not seem reasonable, then you will have to refer to documentation pertaining to the suspect sensor(s). Some sensors connect directly to the CR10X wiring panel while others require some interface electronic modules. The basic process to keep in mind is that the CR10X must excite or "turn on" each sensor, then read some sort of returned value (usually a voltage) from the sensor. The CR10X then converts this returned value to real numeric values.

See also: Verifying Sensor Data with PC208W (pg 17).

Replacing the CR10X Data Collector Canister

The CR10X Data Collector is the unit which interfaces to, and collects data from physical sensors at your data site. It is located in the wall mounted, gray plastic NEMA enclosure. By replacing only the CR10X **canister** and **not** its **wiring panel**, it will be possible to leave the existing sensor wiring undisturbed. See page 24 for an exploded overview of the CR10X and its wiring panel. Please read and understand these instructions prior to attempting to replace the CR10X canister. Should you have any questions, please do not hesitate to contact *Micro Specialties, Inc.*

Removing the old CR10X canister

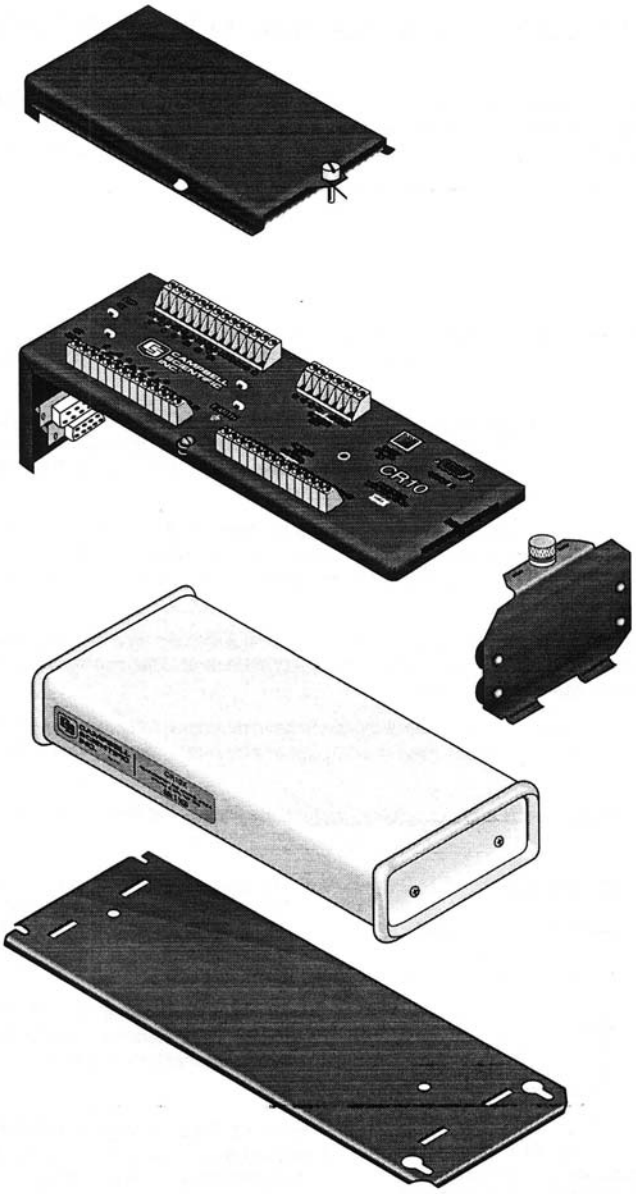
- Unplug the **power in** and **CSIO** connectors from the upper right corner of the CR10X wiring panel. Both of these connectors are friction fit only. Gently grasp each connector by its plastic shell (**not by the wiring**) and withdraw it from its receptacle with a slight rocking motion.
- Loosen the knurled thumbscrew at the right side center of the wiring panel. This will allow the removal of the wiring panel **end cap**. It is not necessary to completely remove the thumbscrew.
- Remove the wiring panel end cap by lifting the wiring panel slightly, then pulling the end cap to the right to disengage it from the wiring panel. The end cap is tabbed into slots in the wiring panel mounting bracket. By tilting the end cap far to the right, these tabs may be disengaged, and the end cap may be completely removed.
- Without disturbing the sensor wiring, gently tilt the wiring panel and canister to the left to facilitate the canister's removal.
- The canister is attached to the wiring panel only by the friction fit of two data connectors on the left end of the canister. Remove the canister by gently rocking and pulling it to the right and away from the wiring panel.
- Set this canister aside so as to not confuse it with the replacement canister.

Installing the new CR10X canister

- Examine the replacement CR10X canister. Notice that it has two connector plugs which must engage two connector receptacles on the wiring panel. Notice also that the wide connector plug must be up in relation to the mounting bracket.
- Slide the new canister from right to left into the wiring panel.
- Carefully, but firmly seat the canister's plugs into the wiring panel's receptacles. Some rocking and pushing motion will facilitate this.
- Insert the tabs of the end cap into the mounting bracket at the right end of the newly installed canister. The thumbscrew tab will project toward the wiring panel when inserted correctly.
- Insert the thumbscrew tab into the wiring panel. The thumbscrew tab slides into the wiring panel end such that the thumbscrew engages the thumbscrew slot in wiring panel.
- Make sure that the rubber bumpers on the end cap project into the recessed end of the canister.
- Tighten the thumbscrew while maintaining moderate pressure toward the canister on the end cap.
- Reinstall the **Power In** connector and the **CSIO** connector.

Prior to closing up the wall mounted enclosure, double check that both the **Power In** and the **CSIO** connectors are properly installed.

CR10X OVERVIEW



CR10X Files

All CR10X files are maintained by Campbell Scientific's PC208W program. PC208W usually installs files in the path: **c:Campbell\pc208w**

Sitename.CSI – This is the CR10X's source program file. This file may be carefully edited to adjust such parameters as sensor update rate, data report interval, etc.

Sitename.DLD - This is the CR10X's executable program file. When you make a change to the CSI file and compile it, the DLD file must be sent to the CR10X.

Sitename.DAT – This is the site's data file. When you ask PC208W to retrieve data from the CR10X, it puts that data here.